FINAL REPORT
SITE INVESTIGATION

Gold Shield Solvents
Grand Rapids, Michigan

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1.0 INTRODUCTION

Gold Shield Solvents, a division of Detrex Corporation, operates a storage facility in Grand Rapids, Michigan for the storage of virgin solvents and solvent destined for recycling at other Gold Shield facilities. During an excavation on an adjacent property owned by Mid-Michigan Services, trichloroethylene and other halogenated volatile organic compounds were found in soil samples collected from within the excavation.

Based on these findings, the Michigan Department of Natural Resources (MDNR) notified Detrex on July 25, 1988 that it was the MDNR's position that their Gold Shield Solvents facility was responsible for the contaminants found within the excavation. A copy of the MDNR's letter of notification is presented within Appendix A.

The MDNR required that Detrex develop a work plan outlining how the extent of the area of contamination adjacent to their facility would be defined and remediated. This work plan was to also include an implementation schedule.

On September 26, 1988, Detrex submitted a work plan to the MDNR entitled "Work Plan - Site Investigation - Gold Shield Solvents - Grand Rapids, Michigan", Conestoga-Rovers & Associates, September 23, 1988. This document was reviewed by the MDNR, and Detrex received notice of the MDNR's approval on October 10, 1988. The sample collection, as proposed in the Work Plan, was completed during the week of December 5, 1988.

The following report presents the field observations made during the Work Plan implementation and presents the analytical data collected.

2.0 OBJECTIVES

The objective of the Site Investigation Work Plan was to investigate the extent and degree of potential soil contamination resulting from past volatile organic chemical storage and handling activities at the Grand Rapids Site. This objective was accomplished by the installation of thirteen boreholes around and adjacent to the Site and beneath the building. The purpose of these installations was as follows:

i) to characterize the surficial geology of the Site;

ii) to determine the presence and extent of any surficial confining beds; and

iii) to obtain soil samples in areas of past material handling on the property for chemical analysis to identify potential source areas of contamination.

The approved Work Plan proposed eleven soil boring locations adjacent to the Site and beneath the building. Based on field screening of the soil samples with an organic vapor analyzer (HNu), two additional soil borings were added on the south side of the building in order to attempt to define the aerial extent of soil contamination.

3.0 DESCRIPTION OF FIELD ACTIVITIES

3.1 EXPLORATION SOIL BORINGS

The firm of Sterns Drilling Inc. was retained by CRA to complete the soil borings at Detrex's Grand Rapids facility. A trailer mounted CME-45 drill rig was utilized to complete the soil borings at ten locations outside the building. A pneumatic jackhammer was used to obtain soil samples at three locations in the basement of the building. The drilling program commenced on December 6, 1988 and was completed on December 8, 1988.

Exploration soil borings were collected at thirteen locations adjacent to and beneath the Grand Rapids building. Nine soil borings were drilled in areas of past material handling to delineate potential source areas on Site. Three soil borings were drilled through the building floor to confirm that a previously identified lower clay unit has not been penetrated beneath the building and to determine whether a contaminant source is present beneath the building. A final soil boring was drilled at the northwest corner of the building in order to establish background conditions at the Site.

At each sampling location, the borehole was extended down to the top of the lower clay unit. Split spoon samples were collected at two-foot intervals starting at the ground surface with the last sample collected from within the lower clay unit. The split spoon sampler was attached to the drill rod and driven into the soil the full depth (24 inches) using a 140-pound

hammer, free-falling 30 inches. The driving resistance (number of hammer blows) was recorded for each six-inch increment of penetration. Clean basket retainers were used to retain the soil in the split spoon. Between each sampling, the split spoon was cleaned as described in Section 3.2.

Soil samples collected from the split spoon were described and classified according to the Unified Soil Classification System and then stored in glass jars for geologic record. Appendix B presents the stratigraphic logs for each of the soil borings. All samples retained for geologic record have been stored on Site. During sampling, HNu readings were recorded for each split spoon as it was opened, as an indication of volatile organic contamination.

Following completion, each borehole was backfilled to the ground surface with cement/bentonite grout.

All sample preparation and handling was carried out as described in the approved Work Plan. Table 3.1 summarizes the total number of samples collected for analysis. Figure 3.1 shows the location of the thirteen soil borings completed.

3.2 EQUIPMENT CLEANING

Prior to mobilizing the drill rig, the rig and all associated equipment was thoroughly steam cleaned to remove oil, grease, mud and other foreign matter. Before initiating drilling at each borehole, the augers,

TABLE 3.1

SUMMARY OF FIELD SAMPLES
GOLD SHIELD SOLVENTS
GRAND RAPIDS, MICHIGAN

	Soils
Number of Samples	39
Blind Duplicates	4
Field Blanks (1)	4
Matrix Spikes	1
TOTAL	45

Notes:

1) Field blank consisted of deionized water poured over a split spoon following the final deionized water rinse of the decontamination protocols.

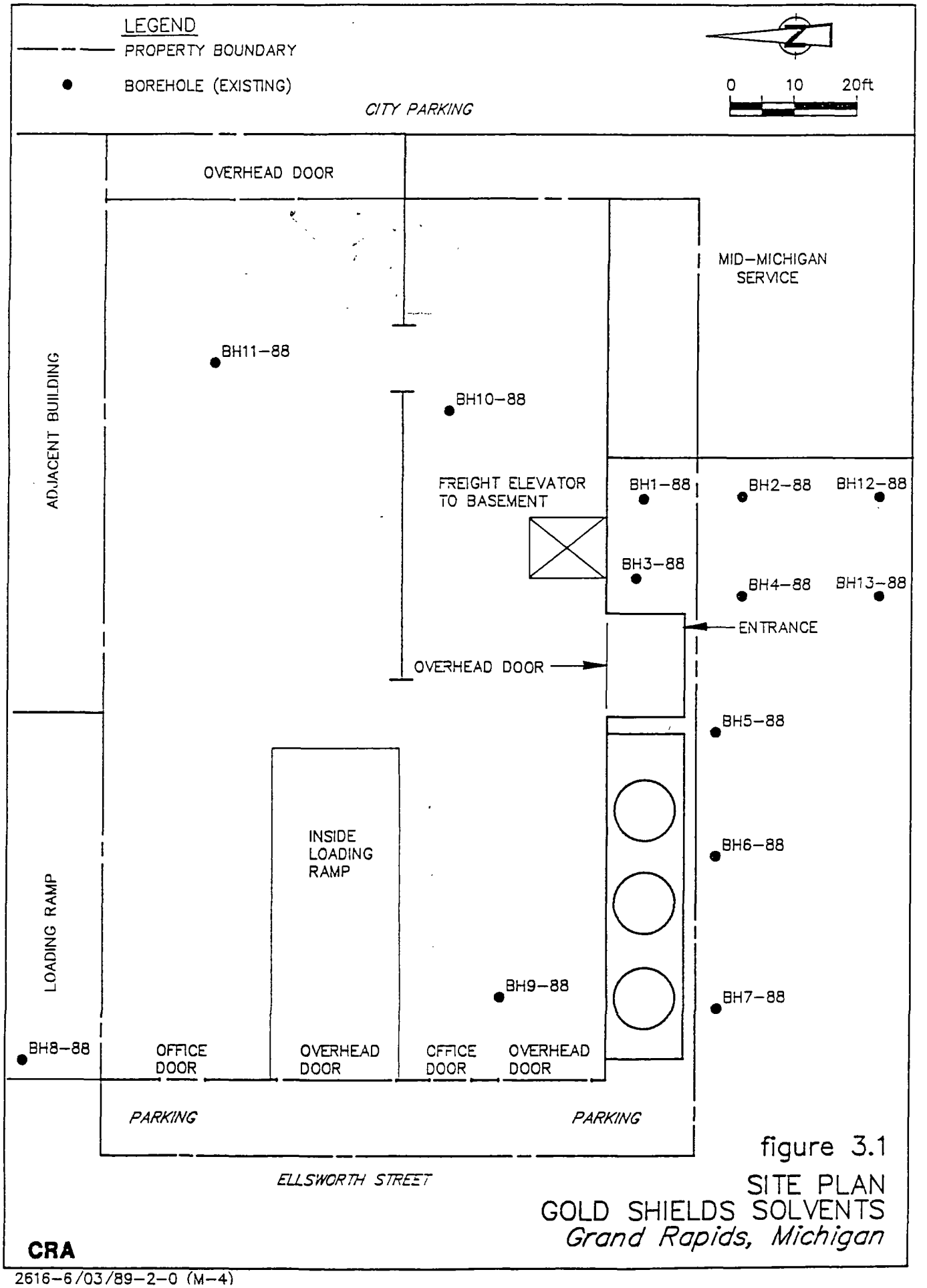

figure 3.1

SITE PLAN
GOLD SHIELDS SOLVENTS
Grand Rapids, Michigan

CRA

2616-6/03/89-2-0 (M-4)

cutting bits, samplers, drill steel and associated equipment were cleaned to prevent cross-contamination from the previous drilling location. All cleaning was conducted at a central area. Cleaning was accomplished by flushing and wiping the components to remove all visible sediments followed by thorough high pressure steam wash and rinsing. The split spoon samplers were further cleaned by an isopropanol/deionized water rinse after each soil sample was collected.

3.3 WASTE HANDLING

All soil cuttings brought to the surface were placed back in each borehole with a mixture of powdered bentonite clay. All soil cuttings which were not placed back into the soil boring from which they came were drummed in Federally approved DOT 55-gallon drums.

Wash water used to clean augers, samplers and all other downhole tooling was placed in DOT approved 55-gallon drums.

All disposable personal protective equipment and other Site garbage was also placed in DOT approved 55-gallon drums.

The drums were clearly labeled and placed on the shipping dock of Gold Shield Solvents pending final disposal.

4.0 FIELD OBSERVATIONS AND ANALYTICAL DATA

4.1 SITE GEOLOGY

The Site geology had previously been described by EDI Engineering & Science (EDI) based on investigative work completed by EDI at the Site in the past. A description of the Site geology was presented in the Work Plan for this Site Investigation.

The results of this most recent investigation confirm the geologic description completed by EDI, as well as expand the available information. This Site investigation confirmed the presence of a continuous layer of clay beneath the Site. The surface of this fine grained clay unit varies in depth from 5.7 feet to 8.1 feet below the ground surface. The presence of the clay unit was also confirmed beneath the building at a depth of approximately 1 to 3 feet below the basement floor. The continuity of this clay beneath the Site and the hydraulic conductivities obtained by EDI show that the clay would impede any further vertical migration of contaminants if present in the overburden soils.

The stratigraphic logs for each of the boreholes are presented in Appendix B.

4.2 ANALYTICAL DATA

4.2.1 General

All samples collected for chemical analysis were shipped under chain of custody via overnight courier (i.e. Federal Express) to Wadsworth/Alert Laboratories, Inc. (Wadsworth) of North Canton, Ohio. Samples were analyzed for volatile organic compounds (VOC's) by Wadsworth following SW846 Method 8010/8020, Third Edition. In addition, samples were analyzed for total petroleum hydrocarbons (TPH) using SW846 Method 8015 (modified).

In addition to Wadsworth's internal Quality Assurance/ Quality Control (QA/QC) procedures, CRA implemented additional QA/QC measures. These additional QA/QC measures included the collection of blind duplicate samples, rinsate blank samples and matrix spike samples.

Based on CRA's QC review of the data, the data were found to be generally acceptable with the exception of the holding times which were surpassed for many of the samples. Although the holding times were missed, the field duplicates showed good analytical precision and the matrix spike recoveries fell within the control limits established for the analytical methods. On this basis, the data is generally acceptable and can be used.

Table 4.1 presents the VOCs data for the soil samples. Table 4.2 summarizes only the positive detections for the VOCs. Table 4.3 presents the TPH data for the soil samples.

4.2.2 Data Summary

The only constituents detected in the 39 soil samples analyzed were trichloroethylene, 1,1,1-trichloroethane and TPH. Twenty of the 39 soil samples analyzed were found to have trichloroethylene present ranging from a high concentration of 920 mg/kg at BH-1 (0.6 to 2.6 feet), to a low of 1 mg/kg at BH-6 (2.5 to 4.5 feet). 1,1,1-Trichloroethane was only detected in six of the 39 samples analyzed, with a high concentration detected of 120 mg/kg at BH-3 (1.0 to 3.0 feet) and a low of 2 mg/kg at BH-7 (0.5 to 2.5 feet). Nine of the 39 soil samples analyzed were found to have TPH concentrations, with the highest concentration of 3,900 mg/kg found at BH-2 (0.4 to 2.4 feet) and the lowest of 11 mg/kg found at BH-12 (2.3 to 4.3 feet).

Of the nine soil samples collected from the three locations beneath the building, only one, BH-11 (1.0 to 2.0 feet) was found to have detectable concentrations of trichloroethylene (310 mg/kg). The remaining eight soil samples did not have any detectable concentrations of VOCs. These data show that, with the exception of an isolated area beneath the northeast corner of the building, the past Site operations have not impacted the overburden soil beneath the building.

TABLE 4.1
ANALYTICAL DATA SUMMARY-VOCs (mg/kg)
GOLD SHEILD SOLVENTS
GRAND RAPIDS, MICHIGAN

SAMPLE ID *LOCATION*	*S-120788-SC-013* *BH-1 (0.6-2.6')*	*S-120788-SC-014* *BH-1 (4.6-6.6')*	*S-120788-SC-015* *BH-1 (6.6-8.6')*	*S-120788-SC-016* *BH-2 (0.4-2.4')*	*S-120788-SC-017* *BH-2 (0.4-2.4')* *(dup. of 016)*	*S-120788-SC-018* *BH-2 (4.4-6.4')*	*S-120788-SC-019* *BH-2 (7.5-8.5')*	*S-120788-SC-020* *BH-3 (1.0-3.0')*	*S-120788-SC-021* *BH-3 (5.0-7.0')*	*DETECTION LIMIT* *(mg/kg)*
Benzene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Benzyl chloride	ND^^	ND++	ND	ND	ND**	ND	ND	ND^	ND^	5
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroisopropyl)ether	ND^^	ND++	ND	ND	ND**	ND	ND	ND^	ND^	5
Bromobenzene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Bromodichloromethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Bromoform	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Bromomethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Carbon tetrachloride	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Chloroacetaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Chloroethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Chloroform	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1-Chlorohexane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
2-Chloroethyl vinyl ether	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Chloromethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Chloromethyl methyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorotoluene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Dibromochloromethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Dibromomethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,2-Dichlorobenzene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,3-Dichlorobenzene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,4-Dichlorobenzene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Dichlorodifluoromethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,1-Dichloroethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,2-Dichloroethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,1-Dichloroethylene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
trans-1,2-Dichloroethylene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Dichloromethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,2-Dichloropropane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
trans-1,3-Dichloropropylene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Ethylbenzene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,1,2,2-Tetrachloroethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,1,1,2-Tetrachloroethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Tetrachloroethylene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Toluene	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
1,1,1-Trichloroethane	ND^	ND+	ND	ND	ND*	ND	ND	120	65	1
1,1,2-Trichloroethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Trichloroethylene	920	.32	2	.3	97	15	2	220	120	1
Trichlorofluoromethane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Trichloropropane	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Vinyl chloride	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1
Xylenes	ND^	ND+	ND	ND	ND*	ND	ND	ND^^^	ND^^^	1

Notes: 1) ND - Not detected above stated detection limit
2) NA - Not Analyzed.
3) * - Detection limit = 20 mg/kg
4) ** - Detection limit = 100 mg/kg
5) + - Detection limit = 3 mg/kg
6) ++ - Detection limit = 15 mg/kg.
7) ^ - Detection limit = 50 mg/kg.
8) ^^ - Detection limit = 250 mg/kg.
9) ^^^ - Detection limit = 10 mg/kg
10) ° - Detection limit = 5 mg/kg
11) °° - Detection limit = 25 mg/kg

TABLE 4 1
ANALYTICAL DATA SUMMARY-VOCs (mg/kg)
GOLD SHIELD SOLVENTS
GRAND RAPIDS, MICHIGAN

SAMPLE ID *LOCATION*	*S-120788-SC-022* *BH-3 (7.0-9 0')*	*S-120788-SC-010* *BH-4 (0.3-2.3')*	*S-120788-SC-011* *BH-4 (4.3-6.3')*	*S-120788-SC-012* *BH-4 (6.3-8 3')*	*S-120788-SC-023* *BH-5 (1 8-3 8')*	*S-120788-SC-025* *BH-5 (5.8-7.8')*	*S-120788-SC-026* *BH-5 (9.0-9.8')*	*S-120888-SC-027* *BH-6 (0.5-2.5')*	*S-120888-SC-028* *BH-6 (2.5-4.5')*	*DETECTION LIMIT (mg/kg)*
Benzene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Benzyl chloride	ND	ND++	ND	ND	ND	ND	ND	ND	ND	5
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroisopropyl)ether	ND	ND++	ND	ND	ND	ND	ND	ND	ND	5
Bromobenzene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Bromodichloromethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Bromoform	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Bromomethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Carbon tetrachloride	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Chloroacetaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Chloroethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Chloroform	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1-Chlorohexane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
2-Chloroethyl vinyl ether	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Chloromethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Chloromethyl methyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorotoluene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Dibromochloromethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Dibromomethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,2-Dichlorobenzene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,3-Dichlorobenzene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,4-Dichlorobenzene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Dichlorodifluoromethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,1-Dichloroethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,2-Dichloroethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,1-Dichloroethylene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
trans-1,2-Dichloroethylene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Dichloromethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,2-Dichloropropane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
trans-1,3-Dichloropropylene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Ethylbenzene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,1,2,2-Tetrachloroethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,1,1,2-Tetrachloroethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Tetrachloroethylene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Toluene	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
1,1,1-Trichloroethane	ND	ND+	ND	ND	6	ND	ND	5	4	1
1,1,2-Trichloroethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Trichloroethylene	.2	20	.4	ND	10	2	ND	.3	.1	1
Trichlorofluoromethane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Trichloropropane	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Vinyl chloride	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1
Xylenes	ND	ND+	ND	ND	ND	ND	ND	ND	ND	1

Notes: 1) ND - Not detected above stated detection limit.
2) NA - Not Analyzed.
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5) + - Detection limit = 3 mg/kg.
6) ++ - Detection limit = 15 mg/kg.
7) ^ - Detection limit = 50 mg/kg
8) ^^ - Detection limit = 250 mg/kg.
9) ^^^ - Detection limit = 10 mg/kg
10) ° - Detection limit = 5 mg/kg.
11) °° - Detection limit = 25 mg/kg

TABLE 4.1
ANALYTICAL DATA SUMMARY-VOCs (mg/kg)
GOLD SHIELD SOLVENTS
GRAND RAPIDS, MICHIGAN

SAMPLE ID LOCATION	S-120888-SC-029 BH-6 (8.0-8.5')	S-120888-SC-030 BH-7 (0.5-2.5')	S-120888-SC-031 BH-7 (2.5-4.5')	S-120888-SC-032 BH-7 (4.5-6.5')	S-120888-SC-041 BH-8 (0.4-2.4')	S-120888-SC-042 BH-8 (4.4-6.4')	S-120888-SC-043 BH-8 (6.4-8.4')	S-120888-SC-044 BH-8 (10.4-12.4')	S-120688-SC-007 BH-9 (0.4-1.0')	DETECTION LIMIT (mg/kg)
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Benzyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Bromobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chloroacetaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1-Chlorohexane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
2-Chloroethyl vinyl ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Chloromethyl methyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Dibromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Dichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
trans-1,3-Dichloropropylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
1,1,1-Trichloroethane	ND	2	ND	ND	ND	ND	ND	ND	ND	1
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Trichloroethylene	ND	2	ND	ND	ND	ND	ND	ND	ND	1
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Trichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	1

Notes 1) ND - Not detected above stated detection limit.
2) NA - Not Analyzed.
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5) + - Detection limit = 3 mg/kg.
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11) °° - Detection limit = 25 mg/kg

TABLE 4 1
ANALYTICAL DATA SUMMARY-VOCs (mg/kg)
GOLD SHIELD SOLVENTS
GRAND RAPIDS, MICHIGAN

SAMPLE ID *LOCATION*	*S-120688-SC-008* *BH-9 (0.4-1.0')* *(dup. of 007)*	*S-120688-SC-009* *BH-9 (4.0-4.5')*	*S-120688-SC-004* *BH-10 (0.4-1.0')*	*S-120688-SC-005* *BH-10 (1.5-2.2')*	*S-120688-SC-006* *BH-10 (2.2-2.8')*	*S-120688-SC-001* *BH-11 (0.3-1.0')*	*S-120688-SC-002* *BH-11 (1.0-2.0')*	*S-120688-SC-003* *BH-11 (3.0-3.5')*	*S-120888-SC-033* *BH-12 (0.3-2.3')*	*DITECTION* *LIMIT* *(mg/kg)*
Benzene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Benzyl chloride	ND	ND	ND	ND	ND	ND	ND**	ND	ND	5
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND	ND**	ND	ND	5
Bromobenzene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Bromoform	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Bromomethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Chloroacetaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Chloroethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Chloroform	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1-Chlorohexane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
2-Chloroethyl vinyl ether	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Chloromethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Chloromethyl methyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorotoluene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Dibromomethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Dichloromethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
trans-1,3-Dichloropropylene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Toluene	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Trichloroethylene	ND	ND	ND	ND	ND	ND	310	ND	2	1
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Trichloropropane	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1
Xylenes	ND	ND	ND	ND	ND	ND	ND*	ND	ND	1

Notes 1) ND - Not detected above stated detection limit.
2) NA - Not Analyzed.
3) * - Detection limit = 20 mg/kg
4) ** - Detection limit = 100 mg/kg.
5) + - Detection limit = 3 mg/kg
6) ++ - Detection limit = 15 mg/kg
7) ^ - Detection limit = 50 mg/kg
8) ^^ - Detection limit = 250 mg/kg
9) ^^^ - Detection limit = 10 mg/kg
10) ° - Detection limit = 5 mg/kg
11) °° - Detection limit = 25 mg/kg

TABLE 4.1
ANALYTICAL DATA SUMMARY-VOCs (mg/kg)
GOLD SHEILD SOLVENTS
GRAND RAPIDS, MICHIGAN

SAMPLE ID *LOCATION*	*S-120888-SC-034* *BH-12 (2.3-4.3')*	*S-120888-SC-035* *BH-12 (2.3-4.3')* *(dup. of 034)*	*S-120888-SC-036* *BH-12 (6.3-8.3')*	*S-120888-SC-037* *BH-13 (0.5-2.5')*	*S-120888-SC-038* *BH-13 (4.5-6.5')*	*S-120888-SC-039* *BH-13 (6.5-8.5')*	*S-120888-SC-040* *BH-13 (6.5-8.5')* *(dup. of 039)*	*DETECTION LIMIT* *(mg/kg)*
Benzene	ND	ND	ND	ND	ND	ND	ND	1
Benzyl chloride	ND	ND	ND	ND	ND	ND	ND	5
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND	ND	5
Bromobenzene	ND	ND	ND	ND	ND	ND	ND	1
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	1
Bromoform	ND	ND	ND	ND	ND	ND	ND	1
Bromomethane	ND	ND	ND	ND	ND	ND	ND	1
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	1
Chloroacetaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	1
Chloroethane	ND	ND	ND	ND	ND	ND	ND	1
Chloroform	ND	ND	ND	ND	ND	ND	ND	1
1-Chlorohexane	ND	ND	ND	ND	ND	ND	ND	1
2-Chloroethyl vinyl ether	ND	ND	ND	ND	ND	ND	ND	1
Chloromethane	ND	ND	ND	ND	ND	ND	ND	1
Chloromethyl methyl ether	NA	NA	NA	NA	NA	NA	NA	NA
Chlorotoluene	ND	ND	ND	ND	ND	ND	ND	1
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	1
Dibromomethane	ND	ND	ND	ND	ND	ND	ND	1
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	1
1,3 Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	1
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	1
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND	ND	1
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	1
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	1
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	1
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	1
Dichloromethane	ND	ND	ND	ND	ND	ND	ND	1
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	1
trans-1,3-Dichloropropylene	ND	ND	ND	ND	ND	ND	ND	1
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	1
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	1
1,1,1,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	1
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	1
Toluene	ND	ND	ND	ND	ND	ND	ND	1
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	1
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	1
Trichloroethylene	8	8	ND	25	ND	ND	ND	1
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	1
Trichloropropane	ND	ND	ND	ND	ND	ND	ND	1
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	1
Xylenes	ND	ND	ND	ND	ND	ND	ND	1

Notes: 1) ND - Not detected above stated detection limit.
2) NA - Not Analyzed.
3) * - Detection limit = 20 mg/kg.
4) ** - Detection limit = 100 mg/kg.
5) + - Detection limit = 3 mg/kg.
6) ++ - Detection limit = 15 mg/kg.
7) ^ - Detection limit = 50 mg/kg
8) ^^ - Detection limit = 250 mg/kg
9) ^^^ - Detection limit = 10 mg/kg
10) ° - Detection limit = 5 mg/kg
11) °° - Detection limit = 25 mg/kg

TABLE 4.2
SUMMARY OF POSITIVE DETECTIONS - VOC'S
GOLD SHEILD SOLVENTS
GRAND RAPIDS, MICHIGAN

LOCATION	*TRICHLOROETHYENE*	*1,1,1-TRICHLOROETHANE*
BH-1 (0.6-2.6')	920	ND(50)
BH-1 (4.6-6.6')	32	ND(3)
BH-1 (6.6-8.6')	2	ND(1)
BH-2 (0.4-2.4')	3/97	ND/ND (1)/(5)
BH-2 (4.4-6.4')	15	ND(1)
BH-2 (7.5-8.5')	2	ND(1)
BH-3 (1.0-3.0')	220	120
BH-3 (5.0-7.0')	120	65
BH-3 (7.0-9.0')	2	ND(1)
BH-4 (0.3-2.3')	20	ND(3)
BH-4 (4.3-6.3')	4	ND(1)
BH-4 (6.3-8.3')	ND(1)	ND(1)
BH-5 (1.8-3.8')	10	6
BH-5 (5.8-7.8')	2	ND(1)
BH-5 (9.0-9.8')	ND(1)	ND(1)
BH-6 (0.5-2.5')	3	5
BH-6 (2.5-4.5')	1	4
BH-6 (8.0-8.5')	ND(1)	ND(1)
BH-7 (0.5-2.5')	2	2
BH-7 (2.5-4.5')	ND(1)	ND(1)
BH-7 (4.5-6.5')	ND(1)	ND(1)
BH-8 (0.4-2.4')	ND(1)	ND(1)
BH-8 (4.4-6.4')	ND(1)	ND(1)
BH-8 (6.4-8.4')	ND(1)	ND(1)
BH-8 (10.4-12.4')	ND(1)	ND(1)
BH-9 (0.4-1.0')	ND/ND (1)/(1)	ND/ND (1)/(1)
BH-9 (4.0-4.5')	ND(1)	ND(1)
BH-10 (0.4-1.0')	ND(1)	ND(1)
BH-10 (1.5-2.2')	ND(1)	ND(1)
BH-10 (2.2-2.8')	ND(1)	ND(1)
BH-11 (0.3-1.0')	ND(1)	ND(1)
BH-11 (1.0-2.0')	310	ND(20)
BH-11 (3.0-3.5')	ND(1)	ND(1)
BH-12 (0.3-2.3')	2	ND(1)
BH-12 (2.3-4.3')	8/8	ND/ND (1)/(1)
BH-12 (6.3-8.3')	ND(1)	ND(1)
BH-13 (0.5-2.5')	25	ND(1)
BH-13 (4.5-6.5')	ND(1)	ND(1)
BH-13 (6.5-8.5')	ND/ND (1)/(1)	ND/ND (1)/(1)

Notes: 1) ND - Not detected at stated limit of detection.
2) ( ) - Number shown in brackets is detection limit.
3) 3/97 - Second number shown is duplicate analysis.

TABLE 4.3
ANALYTICAL DATA SUMMARY - TPH (mg/kg)
GOLD SHEILD SOLVENTS
GRAND RAPIDS, MICHIGAN

SAMPLE ID	*LOCATION*		*RESULT*	*DETECTION LIMIT*
S-120788-SC-013	BH-1 (0.6-2.6')		710	30
S-120788-SC-014	BH-1 (4.6-6.6')		660	30
S-120788-SC-015	BH-1 (6.6-8.6')		ND	10
S-120788-SC-016	BH-2 (0.4-2.4')		739	20
S-120788-SC-017	BH-2 (0.4-2.4')	(dup. of 016)	3900	40
S-120788-SC-018	BH-2 (4.4-6.4')		890	20
S-120788-SC-019	BH-2 (7.5-8.5')		ND	10
S-120788-SC-020	BH-3 (1.0-3.0')		120	20
S-120788-SC-021	BH-3 (5.0-7.0')		ND	20
S-120788-SC-022	BH-3 (7.0-9.0')		ND	10
S-120788-SC-010	BH-4 (0.3-2.3')		3000	30
S-120788-SC-011	BH-4 (4.3-6.3')		193	30
S-120788-SC-012	BH-4 (6.3-8.3')		ND	10
S-120788-SC-023	BH-5 (1.8-3.8')		ND	10
S-120788-SC-025	BH-5 (5.8-7.8')		ND	10
S-120788-SC-026	BH-5 (9.0-9.8')		ND	10
S-120888-SC-027	BH-6 (0.5-2.5')		ND	10
S-120888-SC-028	BH-6 (2.5-4.5')		ND	10
S-120888-SC-029	BH-6 (8.0-8.5')		ND	10
S-120888-SC-030	BH-7 (0.5-2.5')		ND	10
S-120888-SC-031	BH-7 (2.5-4.5')		ND	10
S-120888-SC-032	BH-7 (4.5-6.5')		ND	10
S-120888-SC-041	BH-8 (0.4-2.4')		ND	10
S-120888-SC-042	BH-8 (4.4-6.4')		ND	10
S-120888-SC-043	BH-8 (6.4-8.4')		ND	10
S-120888-SC-044	BH-8 (10.4-12.4')		ND	10
S-120688-SC-007	BH-9 (0.4-1.0')		ND	10
S-120688-SC-008	BH-9 (0.4-1.0')	(dup. of 007)	ND	10
S-120688-SC-009	BH-9 (4.0-4.5')		ND	10
S-120688-SC-004	BH-10 (0.4-1.0')		ND	10
S-120688-SC-005	BH-10 (1.5-2.2')		ND	10
S-120688-SC-006	BH-10 (2.2-2.8')		ND	10
S-120688-SC-001	BH-11 (0.3-1.0')		ND	10
S-120688-SC-002	BH-11 (1.0-2.0')		ND	10
S-120688-SC-003	BH-11 (3.0-3.5')		ND	10
S-120888-SC-033	BH-12 (0.3-2.3')		ND	10
S-120888-SC-034	BH-12 (2.3-4.3')		11	10
S-120888-SC-035	BH-12 (2.3-4.3')	(dup. of 034)	15	10
S-120888-SC-036	BH-12 (6.3-8.3')		ND	10
S-120888-SC-037	BH-13 (0.5-2.5')		38	10
S-120888-SC-038	BH-13 (4.5-6.5')		ND	10
S-120888-SC-039	BH-13 (6.5-8.5')		ND	10
S-120888-SC-040	BH-13 (6.5-8.5')	(dup. of 039)	ND	10

For the soil samples collected outside of the building, trichloroethylene and 1,1,1-trichloroethane were found at their highest concentrations at the ground surface and at the boreholes located in the southeast corner by Mid-Michigan Services. The concentrations of trichloroethylene and 1,1,1-trichloroethane were much lower in the deeper soil samples, and were detected in only three of the ten samples collected at the overburden/clay interface. The exact southerly extent of VOCs in the soil was not clearly delineated by the soil borings completed. The results of these soil analyses indicate that some spillage of VOCs may have occurred, primarily at the southeast corner of the building, with the possibility of small amounts along the aboveground tanks. However, it appears that the asphalt cover over this entire area is minimizing any surface water infiltration, thereby minimizing the vertical migration of the VOCs detected.

There were no VOCs detected in the background borehole (BH-8). This indicates that the presence of VOCs in the overburden soils is isolated to the immediate areas of past and present material handling.

The TPH found in the soil samples analyzed were isolated to the soil borings completed at the southeast corner of the building by Mid-Michigan Services. There is evidence of oil or gasoline spillage in this area. The TPH concentrations, as was the case for VOCs, are highest at the surface and decline vertically through the overburden. There were no TPH concentrations found at the overburden/clay interface. The distribution of TPH concentrations also indicates that the asphalt cover in the area is minimizing the vertical migration of the TPH.

5.0 CONCLUSIONS

Based on the sampling and analytical work completed at the Gold Shield Solvents Site in Grand Rapids, Michigan, the following conclusions are presented:

a) The Site geology described by EDI during previous investigative work was generally confirmed by this study, however, some clay or silty fill material was identified within the overburden. The overburden was comprised of an assortment of fine grained sands and some gravels.

b) A fine grained clay was identified in all of the soil borings completed. The presence of this fine grained clay in all of the borings indicates that the clay is continuous beneath the Site. The continuity of the clay and the hydraulic conductivities previously determined by EDI show that the clay would impede any further vertical migration of the contaminants detected.

c) Concentrations of trichloroethylene, 1,1,1-trichloroethane and total petroleum hydrocarbons (TPH) have been identified in overburden soils adjacent to the south side of the Gold Shield Solvents building and at one isolated location beneath the building. The concentrations of trichloroethylene, 1,1,1-trichloroethane and TPH decline vertically through the overburden to the overburden/clay interface. The asphalt cover over the areas found to be contaminated appears to be effective in minimizing the infiltration of surface water and thereby minimizing the vertical migration of contaminants.

APPENDIX A

NOTIFICATION LETTER

J Shamilla m 16/PTT1

STATE OF MICHIGAN

JAMES J. BLANCHARD, Governor

DEPARTMENT OF NATURAL RESOURCES

David F. Hales, Director
State Office Building
350 Ottawa N. W.
Grand Rapids, Michigan 49503

July 25, 1988

<u>CERTIFIED MAIL</u>

Mr. Charles U. Guy
Detrex Chemical Industries, Inc.
Ashtabula, OH 44004

SUBJECT: Gold Shield Solvents Division, Ellsworth Avenue S. W. Grand Rapids, Michigan (Kent County)

Dear Mr. Guy:

This letter will confirm our meeting of July 19, 1988 last week. As a result of an excavation on Mid-Michigan Service's property adjacent to the south of Gold Shield, soils with significant levels of TCE and other solvent compounds were found. In the past, soils contaminated with solvents, primarily TCE, were found and removed by Gold Shield from property adjacent to the east.

As stated in the meeting, it is our position that Gold Shield Solvents is responsible for this newly discovered area of contamination which is a violation of Act 245, P.A. of 1929, as amended. A work plan outlining how the extent of the area of contamination will be defined and remediated (including implementation schedule) should reach this office by August 26, 1988.

In addition, please provide us with the original "bench sheets" of the soils analysis results you collected from the excavation area. The retabulated information provided to us at the meeting is lacking some important information.

Please do not hesitate to call if you have any questions.

Sincerely,

JK Hoffman

Jenny X. Hoffmann
Geologist
Environmental Response Division
616 - 456-5071

JXH/mam
CC: Dale DeKraker, Waste Management Division
copy to W. Graves, Mid-Michigan Service

AUG - 2 1988

R1026-1

APPENDIX B

STRATIGRAPHIC LOGS

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH1-88
(PAGE 1 of 2)
PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 7, 1988
CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA
LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNU
0	Concrete		7.0" ø BOREHOLE				
1.0	SW(FILL)SAND, some gravel, some silt, dense, well graded, clay lumps, moist, brown, strong solvent odor from surface	-0.6	CEMENT/ BENTONITE GROUT	1SS		23	440
2.0							
3.0	CL(FILL)CLAY, some silt, firm, very moist, brown, solvent odor, low plastic	-3.1		2SS		16	380
4.0							
5.0	Slight solvent odor			3SS		4	200
6.0							
7.0	CL(CLAY) some silt, little sand, trace gravel, firm, nuggetty, low plastic, mottled gray/brown, remoulded with secondary clay mineralization along horizontal and vertical fissures, moist, slight odor	-6.9		4SS		12	200
8.0							
9.0	Brown, nuggetty, odorless			5SS		24	200
10.0							
11.0				6SS		33	180
12.0							
13.0	CL(TILL)CLAY, some silt, some sand, little gravel, stiff, low plastic, brown, moist, odorless	-12.8		7SS		31	

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH1-88 (PAGE 2 of 2)
PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 7, 1988
CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA
LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE *HNU
14.0	CL(TILL)CLAY, some silt, some sand, little gravel, stiff, low plastic, brown, moist, odorless		7.0" ø BOREHOLE; CEMENT/BENTONITE GROUT	7SS		31	
15.0	END OF HOLE @ 14.6 FT. BGS	-14.6					
	NOTES: 1. Hole dry upon completion. 2. HNu reading (in PPM) taken on headspace of sample in glass jar.						
16.0							
17.0							
18.0							
19.0							
20.0							
21.0							
22.0							
23.0							
24.0							
25.0							
26.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH2–88
PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 7, 1988
CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA
LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNu
0	Concrete						
	ML–GM(FILL) Silt, some gravel, some sand, compact, solvent odor	-0.4	7.0" ø BOREHOLE				
1.0			CEMENT/ BENTONITE GROUT	1SS		27	460
2.0							
3.0	CL fill, stiff, brown, solvent odor			2SS		21	380
4.0							
5.0	Same, except with rocks, brick, wood			3SS		34	260
6.0							
7.0	Same, except with coal seam at 7.6'			4SS		10	200
8.0	CL(CLAY)TILL, some silt, little sand, trace gravel, firm, low plastic, brown, slight solvent odor	-7.8					
9.0				5SS		11	40
10.0							
	END OF HOLE @ 10.4 FT. BGS	-10.4					
11.0	NOTES: 1. Hole dry upon completion. 2. HNu reading (in PPM) taken on headspace of sample in glass jar.						
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH3-88
PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 7, 1988
CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA
LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNu
1.0	Concrete		7.0" ø BOREHOLE				
	ML-CL(FILL) SILT&CLAY, some sand, some gravel, firm, brown and black, low plastic, inclusions of bricks, glass, bones, solvent odor	-1.0	CEMENT/ BENTONITE GROUT				
2.0				1SS		12	250
3.0							
4.0				2SS		5	180
5.0							
6.0	Clean fill, no inclusions, slight solvent odor			3SS		7	180
7.0							
8.0				4SS		10	50
	CL(TILL)CLAY, some silt, little sand, trace gravel, stiff, low to medium plastic, brown, odorless	-8.1					
9.0							
10.0				5SS		12	50
11.0		-11.0					
	END OF HOLE @ 11.0 FT. BGS						
12.0	NOTES: 1. Hole dry upon completion. 2. HNu reading (in PPM) taken on headspace of sample in glass jar.						
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH4–88
PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 7, 1988
CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA
LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNu
1.0	Asphalt	-0.3	7.0"ø BOREHOLE; CEMENT/BENTONITE GROUT				
	ML(FILL)SILT&CLAY, some sand, some gravel, stiff, cohesive, brown and black, moist, petroleum odor at surface			1SS		51	80
2.0							
3.0				2SS		15	130
4.0	Same, except with pieces of metal, coal, wood chips, not as stiff, sand seams						
5.0	Same, except with slight petroleum odor, moist			3SS		25	20
6.0							
7.0	CL(TILL)CLAY, some silt, little sand, trace gravel, stiff, low plastic, mottled gray/brown, moist, occasional vertical and horizontal fissure with secondary clay mineralization, odorless	-7.1		4SS		16	25
8.0							
9.0	Clay mineralization, odorless			5SS		12	20
10.0		-10.3					
	END OF HOLE @ 10.3 FT. BGS						
11.0	NOTES: 1. Hole dry upon completion. 2. HNu reading (in PPM) taken on headspace of sample in glass jar.						
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH5-88
PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 8, 1988
CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA
LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNu
1.0	Concrete, after breaking through strong solvent odor noticed		7.0" ø BOREHOLE; CEMENT/ BENTONITE GROUT				
2.0	CL(CLAY)FILL, some silt, some sand, little gravel, firm, medium plastic, brown, strong solvent odor	-1.8					
3.0				1SS		8	450
4.0	Same, except with seam of cinders, sand, bricks						
5.0				2SS		11	480
6.0							
7.0	Same, except with slight solvent odor			3SS		6	180
8.0	CL(TILL)CLAY, some silt, little sand, trace gravel, firm, medium plastic, brown, moist, slight solvent odor	-7.5					
9.0				4SS		19	150
10.0	END OF HOLE @ 9.8 FT. BGS	-9.8					
11.0	NOTES: 1. Hole dry upon completion. 2. HNu readings (in PPM) taken on headspace of sample in glass jar.						
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH6-88
PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 8, 1988
CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA
LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNu
	Concrete						
	GS-SW(FILL)(SAND&GRAVEL), some silt, compact, well graded, black, solvent odor, moist	-0.5	7.0" ø BOREHOLE; CEMENT/BENTONITE GROUT	1SS		19	45
1.0							
2.0	CL(FILL)CLAY, some silt, soft, medium plastic, brown, occasional brick, solvent odor	-2.1		2SS		5	45
3.0							
4.0							
5.0	Very moist, slight solvent odor			3SS		6	30
6.0							
7.0	Moist, odorless			4SS		8	20
8.0	CL(CLAY)TILL, some silt, little sand, trace gravel, stiff, low plastic, brown, moist, odorless	-7.9					
9.0				5SS		12	10
10.0							
	END OF HOLE @ 10.5 FT. BGS	-10.5					
11.0	NOTES: 1. Hole dry upon completion. 2. HNu readings (in PPM) taken on headspace of sample in glass jar.						
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH7–88
PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 8, 1988
CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA
LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNu
0	Concrete						
	CL(FILL)CLAY, some silt, little sand, trace gravel, firm, low plastic, brown, moist, odorless	-0.5	7.0"ø BOREHOLE; CEMENT/BENTONITE GROUT	1SS		7	10
1.0							
2.0							
3.0	Soft, very moist, small gravel and sand pockets			2SS		5	6
4.0							
	Same, except with native CL at 5.3'						
5.0							
	CL(TILL)CLAY, some silt, little sand, trace gravel, stiff, medium, plastic, brown, moist, odorless	-5.3		3SS		12	8
6.0							
7.0							
				4SS		17	6
8.0							
	END OF HOLE @ 8.5 FT. BGS	-8.5					
9.0	NOTES: 1. Hole dry upon completion. 2. HNu readings (in PPM) taken on headspace of sample in glass jar.						
10.0							
11.0							
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH8–88
PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 7, 1988
CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA
LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE # HNu
	Concrete						
	SM&SW(FILL)SAND, some silt, some gravel, poor and well graded, dense, brown, odorless, moist	-0.4	7.0" ø BOREHOLE; CEMENT/BENTONITE GROUT				
1.0				1SS		20	6
2.0							
3.0		-3.2					
	CL(FILL)CLAY, some sand, some gravel, some silt, stiff, low plastic, brown and black, odorless, moist			2SS		11	4
4.0							
5.0				3SS		13	4
6.0							
7.0	CL(TILL)CLAY, some silt, little sand, trace gravel, stiff, low plastic, brown, moist, odorless	-7.0		4SS		15	5
8.0							
9.0				5SS		11	4
10.0							
	SW(SAND) some gravel, dense, well graded, medium to coarse grained, massive, brown, moist, odorless	-10.2					
11.0				6SS		39	8
12.0							
	END OF HOLE @ 12.4 FT. BGS	-12.4					
13.0	NOTES: 1. Hole dry upon completion. 2. HNu readings (in PPM) taken on headspace of sample in glass jar.						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
PROJECT NO.: 2616
CLIENT: DETREX CORPORATION
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH9-88
DATE COMPLETED: DECEMBER 6, 1988
DRILLING METHOD: 3" SS AND JACK HAMMER
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNU
	Concrete floor slab	-0.4	7.0" ø BOREHOLE				
1.0	CL(TILL)CLAY, some silt, little sand, trace gravel, very hard, low plastic, oxide brown, moist, vertical and horizontal fissures with some secondary mineralization, no solvent odor		CEMENT/ BENTONITE GROUT	1SS			5
2.0							
3.0							
	Same, except with occasional silt partings, remoulded till, oxidized, extremely hard			2SS			5
4.0							
		-4.5					
5.0	END OF HOLE @ 4.5 FT. BGS						
	NOTES: 1. Hole dry upon completion. 2. HNu readings (in PPM) taken on headspace of sample in glass jar.						
6.0							
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH10–88

PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 6, 1988

CLIENT: DETREX CORPORATION
DRILLING METHOD: 3" SS AND JACK HAMMER

LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNu
	Concrete slab	-0.4	7.0" ø BOREHOLE				
1.0	ML–CL(FILL)SILT&CLAY, some sand, little gravel, firm, inclusions of ash, wood, coal, sand seam from 16" to 20", clay seam 20" to 26", peaty material approx. 19" to 20", sand (fill) again at 20" to 28"		CEMENT/ BENTONITE GROUT	1SS			<5
2.0							
	OL SILT, some clay, little sand, stiff, brown–black, earthy odor	-2.5					
3.0				2SS			<5
4.0		-3.9					
	ML(SILT)TILL, some sand, trace clay, stiff, mottled, gray–brown, moist, rootlets, odoriess	-4.3					
5.0	CL(TILL)CLAY, some silt, little sand, trace gravel, stiff, low plastic, mottled gray–brown, moist, odoriess			3SS			<5
6.0							
		-6.5					
7.0	END OF HOLE @ 6.5 FT. BGS						
	NOTES: 1. Hole dry upon completion. 2. HNu readings (in PPM) taken on headspace of sample in glass jar.						
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH11–88

PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 6, 1988

CLIENT: DETREX CORPORATION
DRILLING METHOD: 3" SS AND JACK HAMMER

LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNu
0	Concrete floor slab	-0.3	7.0" ø BOREHOLE				
	CL(FILL)CLAY, and silt, some sand, little gravel, soft, low plastic, brown inclusions of earthy soil, wet, solvent odor	-0.8					
1.0	SM–ML(FILL)SAND&SILT, some clay, little gravel, poorly graded, compact, very moist, inclusions of wood, cinders, bricks, slight solvent odor		CEMENT/ BENTONITE GROUT	1SS			<5
2.0							
3.0	CL(CLAY) some silt, firm, low plastic, nuggetty, mottled gray–brown, very moist, occasional pebble to 1 1/2" dia.	-3.1		2SS			<5
4.0							
	END OF HOLE @ 4.3 FT. BGS	-4.3					
5.0	NOTES: 1. HNu readings (in PPM) taken on headspace of sample in glass jar.						
6.0							
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH12-88

PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 8, 1988

CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA

LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE * HNu
1.0	Concrete	-0.3	7.0" ø BOREHOLE				
	CL(FILL)CLAY, some silt, some sand, little gravel, firm, low plastic, wood chips, gravelly sand seams, odorless, moist	-1.2	CEMENT/ BENTONITE GROUT	1SS		9	20
2.0	SM(FILL)SAND, some silt, some gravel, compact, black, moist, inclusions of wood, steel, coal and ashes, odorless						
3.0				2SS		8	15
4.0							
5.0				3SS		4	10
6.0							
7.0	Sand and gravel fill, brown-black, odorless			4SS		7	6
8.0	CL(TILL)CLAY, and silt, little sand, trace gravel, stiff, low plastic, brown, moist, odorless, pebbles to 1/2" dia.	-7.8					
9.0				5SS		12	6
10.0							
	END OF HOLE @ 10.3 FT. BGS	-10.3					
11.0	NOTES: 1. Hole dry upon completion. 2. HNu readings (in PPM) taken on headspace of sample in glass jar.						
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GOLDSHIELD SOLVENTS
HOLE DESIGNATION: BH13–88

PROJECT NO.: 2616
DATE COMPLETED: DECEMBER 8, 1988

CLIENT: DETREX CORPORATION
DRILLING METHOD: 3 1/4" ID HSA

LOCATION: AS PER PLAN
CRA SUPERVISOR: S. CROSSMAN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE *HNu
	Concrete, slight petroleum odor after penetrating concrete with augers	−0.5	7.0" ø BOREHOLE				
1.0	SW(FILL)SAND, some silt, some gravel, dense, well graded, black, moist, odorless, bricks, glass, wood inclusions		CEMENT/BENTONITE GROUT	1SS		14	45
2.0							
3.0				2SS		15	10
4.0	CL(FILL)CLAY, some silt, little sand, some gravel, stiff, low plastic, brown, moist, coal inclusions, petroleum odor	−3.7					
5.0	SW(FILL)SAND&GRAVEL, some silt, compact, well graded, black and brown, coal inclusions, moist, odorless	−4.5		3SS		10	
6.0	CL(TILL)CLAY, some silt, little sand, firm, low plastic, brown, moist, odorless	−5.7					
7.0							
	ML&CL(layered) from 7.5' to 9.0', not continuous through that depth			4SS		7	8
8.0							
9.0							
				5SS		8	6
10.0							
		−10.5					
11.0	END OF HOLE @ 10.5 FT. BGS						
	NOTES: 1. Hole dry upon completion. 2. HNu readings (in PPM) taken on headspace of sample in glass jar.						
12.0							
13.0							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼